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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LE, MIRANDA	

ART UNIT	PAPER NUMBER
2167	

DATE MAILED: 11/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 09/932,578	**Applicant(s)** LEWIS ET AL.	
	Examiner Miranda Le	**Art Unit** 2167	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 18 October 2006 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires *3* months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☐ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: *None*.
   Claim(s) objected to: *None*.
   Claim(s) rejected: *25-35 and 40-48*.
   Claim(s) withdrawn from consideration: *None*.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.
12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08) Paper No(s). _____
13. ☐ Other: _____.

Continuation of 3. NOTE: The applicant has added new limitation "acitve file system...; each snapshot having a corresponding active map indicating in-use blocks and free blocks of the active file system for a point in time at which said snapshot was generated; using the summary map to make write allocation decisions in the storage system" as recited in claims 25, 32. Therefore, the new limitations added would require further search and consideration.
The Applicant has added new claim 49..

Continuation of 11. does NOT place the application in condition for allowance because: Applicants' arguments do not overcome the final rejection.
See attachment.

1. Finality of Office Action is proper because:

After reconsideration for the applicants' request, it was deemed that the scope of the claims 25, 32, 35 as amended in the amendment filed on 06/02/06 has been changed. For example, "maintaining a set of snapshots, each snapshot including a representation of said file system as it was at an earlier time" is quite different from "maintaining a set of snapshots, each snapshot representing a state of said file system at a particular point in time"...

Therefore, it would be improper to not make the present Office Action final where new issues were raised that required further consideration and/or search.

2. Independent claims 25, 35, 43

(a). The Applicants argue that neither Armangau nor Forin discloses "generating a summary map as a logical union of active maps included in at least two of said persistent point-in-time images" as recited in claim 43, since "In Forin, the only situation which two adjacent blocks should be coalesced in to a single piece of memory is if both blocks are free, i.e. of their bitmap values are "01". That is analogous to a logic inter section (AND) operation, not a logical union (OR).

Examiner respectfully disagrees for the following reasons:

In regard to the states of the memory block, Forin discloses in col. 7, lines 20-33 as:

State 1: *The two bits value **01** corresponding to A "**free**" block is one that is not currently allocated and is available for use.*

State 2: *The two bits value **11** corresponding to A "**continue" block is an allocated block that is currently in use**. It is only one block in a series of allocated blocks. The continue block*

can be any block in the series including the starting block, except it cannot be the ending block.

State 3: *The two bits value **10** corresponding to A "last" block is an allocated block that is the ending block in a series of blocks that are part of a large allocation. The designation "last" is also used to identify a single allocated block, since the single block is also the ending block.*

State 4: *The two bits value **00** corresponding to A "sub-allocated" block is a block that is itself a heap. That is, the sub-allocated block consists of a number of smaller-size blocks.*

Of all four states above, only two states: State 1 **(free blocks)** and State 2 **(in-use blocks)**, are mentioned in the final office action. It is noted that the claim limitations claim only **two states:** i.e. "maintaining an active map of information indicating **in-use blocks** and **free blocks** associated with a file system".

Although Examiner agrees with the Applicant that "in Forin, the only situation which two adjacent blocks should be coalesced in to a single piece of memory is if both blocks are free, i.e. of their bitmap values are "01", Examiner does not agree with the Applicants' conclusion "That is analogous to a logic inter section (AND) operation, not a logical union (OR)" (See page 10 in Remarks).

It is brought to the Applicant's attention that the condition clause "if both blocks are free" can be interpreted as: **if block A is free *"and"* block B is free, then block C is free** (wherein block C is a single piece of memory in the coalescence of two adjacent blocks).

Note that the Applicants interpreted the term "***and***" in the sentence above as a **logical AND operation**, however, **"*and*" is not the logical AND operation,** rather, "***and***" **is a conjunction** as presented in that sentence, whereas the **logical AND operation** is a logical operation applies to binary numbers or bit values, which consist of 0, and 1.

Accordingly, **"if both blocks are free", then block C is free** (wherein block C is a single piece of memory in the coalescence step of Forin) can be illustrated as below:

First, the condition clause **"if both blocks are free", then block C is free**; implies four possible outcomes as:

Outcome 1: if block A is ***free***, block B is ***free***, then block C is ***free***.

Outcome 2: if block A is ***free***, block B is ***in-used***, then block C is ***in-used***.

Outcome 3: if block A is ***in-used***, block B is ***free***, then block C is ***in-used***.

Outcome 4: if block A is ***in-used***, block B is ***in-used***, then block C is ***in-used***.

Second, the following outcomes show the results when applying the two bit values of Forin (**01** corresponds to **free**, and **11** corresponds to **in-used,** See state 1, 2 above) to the corresponding allocation states:

Outcome 1: if block A is ***01***, block B is ***01***, then block C is ***01***.

Outcome 2: if block A is ***01***, block B is ***11***, then block C is ***11***.

Outcome 3: if block A is ***11***, block B is ***01***, then block C is ***11***.

Outcome 4: if block A is ***11***, block B is ***11***, then block C is ***11***.

Third, applying a logical AND operation to the above outcomes, the outcomes could be written as:

Outcome 1: 01 AND 01 = 01 (correct)

Outcome 2: 01 AND 11 = 11 ***(incorrect)***

Outcome 3: 11 AND 01 = 11 ***(incorrect)***

Outcome 4: 11 AND 11 = 11 (correct)

For the above reasons, it is ***incorrect*** when applying an **intersection (AND) operation** to the Outcome 2, and Outcome 3.

Fourth, in applying a logical OR operation to the above outcomes, the outcomes could be written as:

Outcome 1: 01 OR 01 = 01 (correct)

Outcome 2: 01 OR 11 = 11 (correct)

Outcome 3: 11 OR 01 = 11 (correct)

Outcome 4: 11 OR 11 = 11 (correct)

Examiner thus maintains the rejection, and asserts that Forin does teach a logical union (OR). The knowledge that is within the level of one of ordinary skill is highlighted hereinabove for the Applicant's convenience. Examiner believes that the Applicants have failed to determine the level of ordinary skill as taught by Forin.

The use of the knowledge would have been obvious to one ordinarily skilled in the art at the time of the invention to combine the teachings of Armangau with the teachings of Forin to disclose "generating a summary map as a logical union of active maps included in at least two of said persistent point-in-time images.

As to claims 25, 35, under similar rationale as provided in (a), the same reasoning would be applicable to claims 25, 35.

(b). Applicants argue that Armangau does not teach "maintaining an active map of information indication indicating in-use blocks and free blocks associated with a file system.

On the contrary, Armangau teaches an active map *(i.e. a bit map)* in col. 13, lines 58-65 as *"The bit map is a set of bits, such as a list, table, or array, including a respective bit for each track"*.

Armangau teaches an active map of information indicating in-use blocks *(i.e. the first bit map indicates the modified state of the first track), this could be interpreted as the first track (or block as recited in claim) is not free or in-used* (col. 13, lines 58-65).

Armangau teaches an active map of information indicating free blocks *as a list of pointers to free tracks* (col. 13, line 66 to col. 14, line 7).

Armangau teaches the blocks associated with a file system *as* "In accordance with a first aspect of the invention, there is provided a method of maintaining in data storage of *a data storage system.*" (col. 2, lines 11-34).

It is noted that a data storage system consists of an operating file system to operate a storage system; since data storage cannot be operated by itself. Therefore, the snapshot operation, snapshot copy are performed by the file operations such as open, write, read, close..., which reads on "blocks associated with a file system". Furthermore, Armangau teaches the blocks associated with a file system as "The recovery routine in effect performs an "abort" operation. The "checkpoint" statement, for example, is compiled as a call to an ***operating system*** routine that flushes any file buffers to storage and updates a log of modifications to storage in

such a way that the state of the files at that point can be recovered even if there is a failure of the host during the flushing operation" (col. 21, lines 27-45).

(c). Applicants argue that Armangau does not teach "generating a summary map of active maps included in at least two of said persistent point-in-time images".

In contrast, under similar rationale as provided in (b), the same reasoning would be applicable to "generating a summary map of active maps included in at least two of said persistent point-in-time images". It is thus clearly shown by Armangau active maps as explained in (b).

Further, Fig. 6 of Armangau has shown a summary map as "List of pointers to track in snapshot disks for production volume extent", which include at least two of said persistent point-in-time *(i.e. a date/time stamp when the snapshot copy was made, col. 18, lines 18-37)* images as "snapshot track 0 and snapshot track 1" (See Fig. 6).

(d). Applicants argue that Goldstein does not disclose deleting a snapshot.

Goldstein teaches the summary map *(i.e. the snapshot mapping data, col. 4, lines 11-26)* and in Fig. 4.

It is noted that the Fig. 4 shows five snapshot consistent states (S0, S1, S2, S3, S4) which correspond to time line t as: $t0 < t1 < t2 < t3 < t4$ (See Goldstein, col. 4, lines 1-10)

Goldstein teaches the step of deleting a particular snapshot (S1 in Fig. 4) in col. 4, lines 41-51 as "*the first state snapshot may be partially deleted*".

Goldstein teaches (See col. 4, lines 41-51) a snapshot (i.e. S0 in Fig. 4) just prior to said particular snapshot (i.e. S1 in Fig. 4) and a snapshot (i.e. S2 in Fig. 4) just after said particular snapshot.

Armangau teaches all the claimed limitation of claim 32, except "receiving a request to delete a particular snapshot; and deleting said particular snapshot, wherein said deleting involves, for a block used by said particular snapshot, indicating said blocks is free in said summary map depending on a snapshot just prior to said particular snapshot and a snapshot just after said particular snapshot".

Goldstein teaches receiving a request to delete a particular snapshot; and deleting said particular snapshot, wherein said deleting involves, for a block used by said particular snapshot, indicating said blocks is free in said summary map depending on a snapshot just prior to said particular snapshot and a snapshot just after said particular snapshot *(col. 4, lines 41-51, Fig. 4).*

It would have been obvious to one of ordinary skill of the art having the teaching of Armangau and Goldstein at the time the invention was mage to modify the system of Armangau to receiving a request to delete a particular snapshot; and deleting said particular snapshot, wherein said deleting involves, for a block used by said particular snapshot, indicating said blocks is free in said summary map depending on a snapshot just prior to said particular snapshot and a snapshot just after said particular snapshot as taught by Goldstein. One of ordinary skill in the art would be motivated to make this combination in order to release blocks in the storage pool containing data unique to the base state snapshot and the first state snapshot in view of Goldstein *(col. 4, lines 41-51)*, as doing so would give the added benefit of having restored the

data volume by restoring the base state data with data blocks contained in one or more succedent backups as taught by Goldstein *(col. 2, lines 40-58)*.

For the reasons set forth above, Applicant's arguments have been fully considered but they are not persuasive.

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